WATER SUPPLY OUTLOOK
and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS
for
MONTANA

UNITED STATES DEPARTMENT of AGRICULTURE···SOIL CONSERVATION SERVICE.
and
MONTANA AGRICULTURAL EXPERIMENT STATION

Data included in this report were obtained by the agencies named above in cooperation with Federal, State, and private organizations listed on the inside back cover of this report.

AS OF
FEB. 1, 1965

UNITED STATES DEPARTMENT OF AGRICULTURE - SOIL CONSERVATION SERVICE

To Recipients of Water Supply Outlook Reports:

The climate of the cultivated and populated areas of the West is characterized by relatively dry summer months. Such precipitation as occurs falls mostly in the winter and early spring months when it is of little immediate benefit to growing crops. Most of this precipitation falls as mountain snow which stays on the ground for months, melting later to sustain streamflow during the period of greatest demand during late spring and summer. Thus, nature provides in mountain snow an imposing water storage facility.

The amount of water stored in mountain snow varies from place to place as well as from year to year and accordingly, so does the runoff of the streams. The best seasonal management of variable western water supplies results from advance estimates of the streamflow.

A snow survey consists of a series of about ten samples taken with specially designed snow sampling equipment along a permanently marked line, up to 1000 feet in length, called a snow course. The use of snow sampling equipment provides snow depth and water equivalent values for each sampling point. The average of these values is reported as the snow survey measurement for a snow course.

Snow surveys are made monthly or semi-monthly beginning in January or February and continue through the snow season until April, May or June. Currently more than 1400 western snow courses are measured each year. These measurements furnish the key data for water supply forecasts.

Streamflow forecasts are obtained by a comparison of total or maximum snow accumulation, as measured by snow water equivalent, to the subsequent spring and summer or snowmelt season runoff over a period of years. The snow water equivalent measured in selected snow courses provides most of the index to the streamflow forecast for the following season. More accurate forecasts are usually obtained when other factors such as soil moisture, base flow and spring precipitation are considered and included in the forecast procedure. Early season forecasts assume average climatic conditions through the snowmelt season.

Listed below are the Federal-State-Private Cooperative Snow Survey and Water Supply Forecast reports available for the West which contain detailed information on snow survey measurements, streamflow forecasts, reservoir storage, soil moisture and other guide data to water management and conservation decisions. Soil Conservation Service Reports may be secured from Soil Conservation Service, 511 N.W. Broadway - Room 507, Portland, Oregon 97209.

PUBLISHED BY SOIL CONSERVATION SERVICE

REPORTS	ISSUED	LOCATION	COOPERATING WITH
RIVER BASINS			
WESTERN UNITED STATES	MONTHLY (FEB.-MAY)	PORTLAND, OREGON	ALL COOPERATORS
BASIC DATA SUMMARY	OCTOBER 1	PORTLAND, OREGON	ALL COOPERATORS
STATES			
ALASKA	MONTHLY (MAR.-MAY)	PALMER, ALASKA	ALASKA S.C.D.
ARIZONA	SEMI-MONTHLY (JAN.15 - APR.1)	PHOENIX, ARIZONA	SALT R. VALLEY WATER USERS ASSOC. ARIZ. AGR. EXP. STATION
COLORADO AND NEW MEXICO	MONTHLY (FEB.-MAY)	FORT COLLINS, COLORADO	COLO. STATE UNIVERSITY COLO. STATE ENGINEER N. MEX. STATE ENGINEER
IDAHO	MONTHLY (JAN.-JUNE)	BOISE, IDAHO	IDAHO STATE RECLAMATION ENGINEER
MONTANA	MONTHLY (JAN.-JUNE)	BOZEMAN, MONTANA	MONT. AGR. EXP. STATION.
NEVADA	MONTHLY (JAN.-MAY)	RENO, NEVADA	NEVADA DEPT. OF CONSERVATION AND NATURAL RESOURCES DIVISION OF WATER RESOURCES
OREGON	MONTHLY (JAN.-JUNE)	PORTLAND, OREGON	OREG. STATE UNIVERSITY OREGON STATE ENGINEER
UTAH	MONTHLY (JAN.-JUNE)	SALT LAKE CITY, UTAH	UTAH STATE ENGINEER
WASHINGTON	MONTHLY (FEB.-JUNE)	SPOKANE, WASHINGTON	WN. STATE DEPT. OF CONSERVATION
WYOMING	MONTHLY (FEB.-JUNE)	CASPER, WYOMING	WYOMING STATE ENGINEER

PUBLISHED BY OTHER AGENCIES

REPORTS	ISSUED	AGENCY
BRITISH COLUMBIA	MONTHLY (FEB.-JUNE)	WATER RESOURCES SERVICE, DEPT. OF LANDS, FOREST AND WATER RESOURCES, PARLIAMENT BLDG., VICTORIA, B.C., CANADA
CALIFORNIA	MONTHLY (FEB.-MAY)	CALIF. DEPT. OF WATER RESOURCES, P.O. BOX 388, SACRAMENTO, CALIF.

USDA-S.S PORTLAND OREG. 1964

WATER SUPPLY OUTLOOK

FEDERAL-STATE-PRIVATE COOPERATIVE SNOW SURVEYS

for

MONTANA

Report Prepared

By

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and

Stanley E. Cook

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Box 855
Bozeman, Montana

Issued By

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State Conservationist
Soil Conservation Service
Bozeman, Montana

J. A. Asleson, Director
Montana Agricultural
Experiment Station
Bozeman, Montana

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MONTANA
WATER SUPPLY OUTLOOK
as of
February 1, 1965

Many high elevation snow courses in the southern portion of the state have February 1 water contents that are maximum or near maximum on record. Almost all snow courses in the state are above average. Continuous heavy mountain precipitation from the headwaters of the Missouri and Yellowstone Rivers during the next few months could produce runoff in excess of previous maximums.

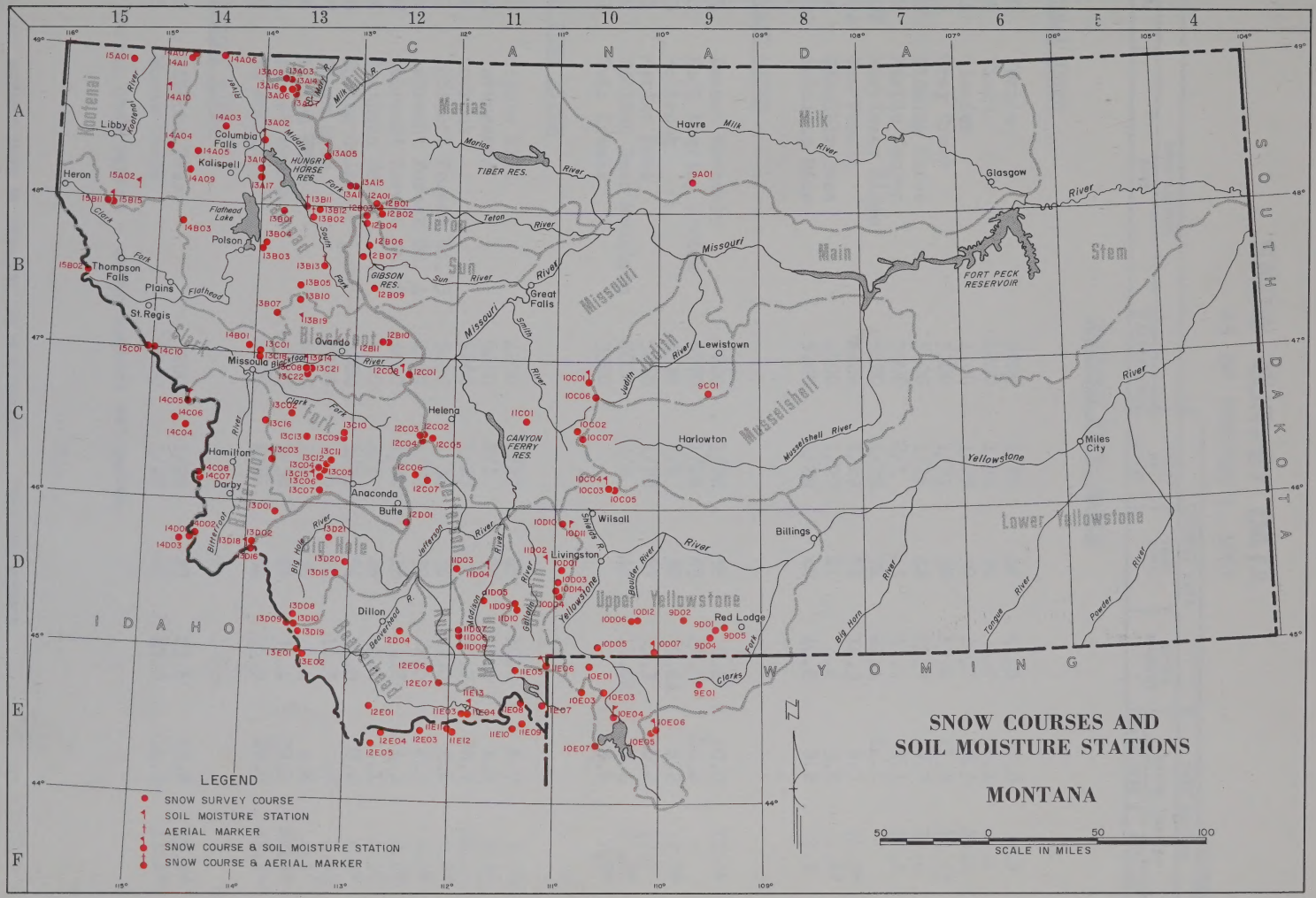
Snow accumulation west of the divide is presently near the April 1 average except in the Kootenai where snow is only 20 percent above last year and 105 percent average. Snow cover on other Columbia River tributaries varies from about 25 percent above average in the Flathead River drainage to 50 percent above average in the Bitterroot. The Clark Fork drainage is about 35 percent above the 1948-62 average. These amounts are 30 to 50 percent greater than was measured last year at this time.

East of the divide, record or near record water equivalents have been recorded at many high elevation snow courses in the headwaters of the Missouri and Yellowstone drainages. Snow courses located on tributaries to the main stem of the Missouri River have not received as much heavy precipitation and are about 25 percent above last year and 40 percent above the 15 year average. Snow cover in the Jefferson River drainage is 177 percent of last year and 60 percent above average. The Madison River drainage has a snow accumulation that is 90 percent more than last year and 80 percent above average. In the Gallatin the snow pack is 80 percent above last year and 65 percent above average. In the headwaters of the Yellowstone River drainage the snow pack is 194 percent of last year and 172 percent average.

Even if mountain precipitation is below average for the remainder of the season, runoff from mountain streams would still be near average. If the present trend of heavy precipitation at high elevations continues, runoff will be near maximum of record.

Mountain soil moisture is not changed from last month and remains generally above average at lower elevations and near to below average at higher elevations.

A more complete picture of the water supply outlook will be obtained next month when all snow courses are measured.


SNOW COURSES AND
SOIL MOISTURE STATIONS
MONTANA
LEGEND
SNOW SURVEY COURSE
SOIL MOISTURE STATION
AERIAL MARKER
SNOW COURSE & SOIL MOISTURE STATION
SNOW COURSE & AERIAL MARKER
SCALE IN MILES
50 0 50 100
CANADA
IDAHO
WYOMING
SOUTH DAKOTA
Libby
Columbia Falls
Kalispell
Heron
Polson
Thompson Falls
Plains
St. Regis
Missoula
Hamilton
Darby
Anaconda
Butte
Dillon
Ovando
Helena
Great Falls
Havre
Glasgow
Lewistown
Harlowton
Wilsall
Livingston
Billings
Red Lodge
Miles City
FORT PECK RESERVOIR
TIBER RES.
GIBSON RES.
CANYON FERRY RES.
Kootenai
Flathead
Clark Fork
Blackfoot
Big Hole
Beaverhead
Madison
Gallatin
Upper Yellowstone
Teton
Sun
Missouri
Main Stem
Marias
Milk
Judith
Musselshell
Lower Yellowstone

SNOW SURVEY DATA

AS OF FEBRUARY 1, 1965

(Inches)

SNOW COURSE			CURRENT DATA			PAST RECORD	
						WATER CONTENT	
NO.	NAME	ELEVATION	DATE OF SURVEY	SNOW DEPTH	WATER CONTENT	LAST YEAR	AVERAGE
	COLUMBIA RIVER BASIN						
KOOTENAI RIVER							
BC 10	Fernie	3500	1/29	42	11.6	7.0	7.3
BC12A	Field	4200	1/30	30	6.9	4.1	5.1
BC 11	Glacier	4100	1/28	59	15.1	19.5	19.6
BC 43	Gray Creek	5100	1/31	52	13.6	11.9	12.6*
BC 33	Kicking Horse	5400	1/26	42	10.7	9.7	10.8
BC 32	Marble Canyon	5000	2/1	45	11.1	9.1	11.1
BC 10B	Morrissey Ridge	6100	1/29	72	22.4	24.5	-
BC 10A	New Fernie	4100	1/29	52	14.3	6.3	10.8*
BC 8A	Sinclair Pass	4500	1/27	21	4.4	3.8	4.6*
BC 20A	Sullivan Mine	5100	1/28	40	10.8	8.2	9.5
FLATHEAD RIVER							
13A02	Desert Mountain	5600	1/29	56	16.2	10.8	10.8*
14A03	Hell Roaring Divide	5770	1/28	83	28.5	20.2	-
13B13	Holbrook	4530	2/1	39	9.8A	6.2	7.7*
13A05	Marias Pass	5250	1/28	57	15.3	10.2	12.9
13B02	Spotted Bear Mountain	7000	2/2	45	13.0A	7.4	11.2*
13B11	Twin Creeks	3580				8.6	9.8*
CLARK FORK RIVER							
13B10	Coyote Hill	4200	1/29	45	10.2	6.7	7.8*
13C04	Intergaard	6450	2/1	34	8.4	4.9	5.4
15B02	Lookout	5250	1/27	101	27.7	26.7	26.4
13C21	Lubrecht Forest No. 3	5450	1/30	35	7.0	8.6	5.8*
13C22	Lubrecht Forest No. 4	4650	1/30	19	4.6	4.0	2.9*
13C08	Lubrecht Forest No. 6	4040	1/30	18	4.8	4.3	3.6*
13C05	Southern Cross	6500	2/1	29	6.6	4.1	4.3
13C18	Spring Gulch	6000	1/30	54	14.0	9.0	8.8*
13C07	Storm Lake	7780	1/29	50	12.9	7.0	8.9*
13C06	Stuart Mill	6500	2/1	30	6.4	4.8	4.4
13C01	Stuart Mountain	7400	1/30	88	31.4	22.1	21.9*
14B01	TV Mountain	6800	1/31	64	15.9	10.6	11.7*
BITTERROOT RIVER							
13D02	Gibbons Pass	7100	1/28	83	23.8	16.8	15.7*
13D16	Moose Creek	6200	1/28	67	17.0	14.0	11.4*

A - Aerial observation - water content estimated.

NOTE: ALL AVERAGES BASED ON 1948-1962 (15 YEAR PERIOD). *ADJUSTED AVERAGE

SNOW SURVEY DATA

AS OF FEBRUARY 1, 1965

(Inches)

SNOW COURSE NO.	SNOW COURSE NAME	ELEVATION	CURRENT DATA: DATE OF SURVEY	CURRENT DATA: SNOW DEPTH	CURRENT DATA: WATER CONTENT	PAST RECORD: WATER CONTENT: LAST YEAR	PAST RECORD: WATER CONTENT: AVERAGE
	MISSOURI RIVER BASIN						
	BEAVERHEAD RIVER						
12E03	Camp Creek	6800	1/29	44	13.3	5.0	6.5
12D04	Carter Creek	7400	1/30	23	4.5	-	-
11E12	Kilgore	6200	1/28	39	10.6	6.0	6.4
	JEFFERSON RIVER						
12C06	Picnic Grounds	6500	2/1	19	3.3	3.0	3.3
12D01	Pipestone Pass	7200	1/28	18	3.4	3.2	3.3*
	MADISON RIVER						
11E09	Big Springs	6500	1/28	81	22.2	11.4	13.7
11E05	Hebgen Dam	6550	1/29	56	12.6	7.2	8.1
11E10	Island Park	6315	1/29	73	19.4	8.7	10.8
10E02	Norris Basin	7500	1/30	54	11.5	8.5	6.9*
11E08	Valley View	6500	1/29	76	23.5	11.5	9.6
11E07	West Yellowstone	6700	1/28	55	13.4	6.8	7.8
	GALLATIN RIVER						
10D14	Arch Falls	7350	1/30	44	10.6	6.4	-
10D04	Devil's Slide	8100	1/30	77	21.8	11.9	12.7*
10D03	Hood Meadow	6600	1/30	38	8.4	4.6	5.5*
10D01	New World	6700	1/27	32	7.7	6.2	6.6
11E06	Twenty-One Mile	7150	1/29	82	23.1	11.0	12.1
	MISSOURI RIVER (Main Stem)						
12C05	Chessman Reservoir	6200	1/4	14	3.1	-	3.1
12C02	Ten Mile Lower	6250	2/3	28	6.2	5.4	4.9
13C03	Ten Mile Middle	6800	2/3	42	9.8	7.8	7.3
12C04	Ten Mile Upper	8000	2/2	49	13.3	10.4	9.1
	UPPER YELLOWSTONE RIVER						
10E03	Canyon	7750	1/29	74	21.7	10.0	9.4
10E06	East Entrance	7000	2/1	42	10.4	6.8	7.9*
9D05	Grizzly Peak	8400	1/28	50	9.8	4.1	-
10E04	Lake Camp	7850	1/28	49	10.9	4.4	6.5*
9E01	Lodgepole	8200	2/1	40	10.0	6.7	6.6*
10E01	Lupine Creek	7300	1/30	47	10.4	6.0	7.3
10D07	Northeast Entrance	7400	1/30	45	10.4	5.4	5.8
10E05	Sylvan Pass	7100	2/1	54	16.0	8.8	9.3*
10E07	Thumb Divide	7900	1/31	80	27.3	11.8	14.4*

NOTE: ALL AVERAGES BASED ON 1948-1962 (15 YEAR PERIOD). *ADJUSTED AVERAGE

SOIL MOISTURE DATA

AS OF FEBRUARY 1, 1965

(Inches)

SOIL MOISTURE STATION			SOIL PROFILE		CURRENT DATA		PAST RECORD	
NO.	NAME	ELEVATION	DEPTH	FIELD CAPACITY	DATE OF SURVEY	SOIL MOISTURE	LAST YEAR	**AVERAGE
			COLUMBIA RIVER BASIN					
Kootenai								
15B15M	Baree Trail	3800	48	7.5	Not measured		-	-
14A10M	Murphy Lake R.S.	3000	48	22.6	2/1	19.6	-	-
15A02M	Raven R.S.	3050	48	23.0				
Flathead								
13A02M	Desert Mountain	5600	54	8.4	1/29	7.1	5.8	6.8
13A05M	Marias Pass	5250	54	6.5			4.4	5.0
Clark Fork								
13C15M	Georgetown Lake	6450	48	9.0*	1/29	2.6	2.4	-
13B19M	Seeley Lake	4030	48	11.9*	2/1	7.5	1.6	-
13C03M	Skalkaho Summit	7260	48	10.8	Not measured		-	-
Bitterroot								
13D18M	Gibbons Pass	7100	48	7.1	1/28	5.5	5.5	-
14C05M	Lolo Pass	5250	48	10.6*	1/28	7.7	5.2	-
			MISSOURI RIVER BASIN					
Beaverhead								
11E13M	Lakeview	6700	48	15.3			8.3	-
Madison								
10D04M	Red Bluff	4800	40	4.7	1/30	2.3	1.5	-
Gallatin								
11D02M	College Site	4856	54	14.5	1/29	10.0	6.8	8.7
11E06M	Twenty-One Mile	7150	48	8.8	1/28	1.5	3.8	-
Missouri Main Stem								
10C01M	Kings Hill	7420	48	11.8	1/28	7.8	7.7	-
12C08M	Stemple Pass	6350	48	5.9	2/1	4.2	3.9	-
Yellowstone								
10D11M	Battle Ridge	6020	48	17.6*	2/1	15.3	9.3	-
10D07M	Northeast Entrance	7350	48	9.4	1/30	5.8	7.9	-

**AVERAGE FOR PERIOD OF RECORD

RESERVOIR STORAGE DATA

AS OF JANUARY 31, 1965

(1000 Acre Feet)

BASIN	RESERVOIR	USEABLE CAPACITY	USEABLE STORAGE THIS YEAR	USEABLE STORAGE LAST YEAR	USEABLE STORAGE AVERAGE
COLUMBIA RIVER BASIN					
Flathead	Hungry Horse	3,428.0	2,811.0	2,450.0	2,693.4**
	Flathead Lake	1,791.0	1,384.0	1,591.0	1,042.9
	Camas 1/	45.2	18.8	17.9	30.4
	Mission Valley 2/	100.3	36.5	17.4	31.9
Clark Fork	Georgetown Lake	31.0	29.6	28.9	24.5
	Noxon Rapids	334.6	331.0	297.9	-
Bitterroot	Como	34.9	12.0	5.3	10.8
	Painted Rocks	31.7	-	22.8	14.0**
MISSOURI RIVER BASIN					
Beaverhead	Clark Canyon	-	64.8	-	-
	Lima	84.0	-	-	26.0
Ruby	Ruby	38.8	-	-	18.4**
Madison	Hebgen Lake	384.8	220.8	211.3	180.4
	Ennis Lake	41.0	37.1	39.2	36.8
Gallatin	Middle Creek	8.0	3.7	2.9	3.3**
Missouri	Canyon Ferry	2,043.0	1,831.0	1,732.0	1,553.9**
	Hauser & Helena	61.9	59.6	48.9	51.8
	Lake Helena	10.4	9.6	6.0	7.2
	Holter Lake	81.9	63.5	56.9	59.6
	Smith River	10.7	8.5	7.4	5.2**
	Ackley Lake	5.8		-	3.8
	Durand	7.0	5.5	3.9	3.9**
	Martinsdale	23.1	7.6	8.2	8.5**
	Deadman's Basin	72.2	43.0	48.2	39.5**
	Fort Peck	19,138.0	15,290.0	11,720.0	10,575.1
Sun	Gibson	105.0	46.2	16.4	55.7
	Willow Creek	32.3	15.6	21.0	18.6
	Pishkun	32.0	17.4	17.5	19.2
Marias	Lower Two Medicine	16.6	-	-	0.0
	Four Horns	19.2		-	9.1
	Swift	30.0	-	10.3	19.9
	Lake Francis	112.0		33.2	91.7
	Tiber	1,313.0	657.3	642.8	628.0**
Milk	Fresno	127.2	64.4	39.8	59.4
	Nelson	66.8	36.7	33.2	36.7
	Lake Sherburne	66.1	-	15.5	18.4
Yellowstone	Mystic Lake	20.8	11.8	11.2	10.7
	Tongue River	68.0	-	40.7	11.6**
	Cooney	27.5	14.5	16.2	10.8**

1/ Sum of four small reservoirs on west side of Flathead Lake.
2/ Sum of eight small reservoirs in Mission Valley not including Jocko Lake.

NOTE: ALL AVERAGES BASED ON 1948-1962 (15 YEAR PERIOD). **AVERAGE FOR PERIOD OF RECORD

Agencies Cooperating in Collecting Data Contained in this Bulletin

U. S. Forest Service
Region 1, Missoula, Montana

U. S. Geological Survey
Helena, Montana

U. S. Army Corps of Engineers
Portland, Oregon
Seattle, Washington
Omaha, Nebraska

U. S. Indian Irrigation Service
St. Ignatius, Montana

U. S. Weather Bureau
Helena, Montana

U. S. Bureau of Sports Fisheries and Wildlife
Red Rock Lakes Refuge
Monida, Montana

U. S. Bureau of Reclamation
Billings, Montana
Boise, Idaho

Montana Power Company
Butte, Montana

Agricultural Experiment Station
North Montana Branch Station
Havre, Montana

State Water Conservation Board
Helena, Montana

National Park Service
Yellowstone National Park
Glacier National Park

Montana Experiment Station
Montana State College
Bozeman, Montana

Bonneville Power Administration
Portland, Oregon

Montana State University
School of Forestry
Missoula, Montana

Soil Conservation Service
Montana, Wyoming, Idaho

Soil and Water Conservation Districts
Montana Counties

Johnson Flying Service, Inc.
Missoula, Montana

Water Rights Branch, Dept. of Lands and Forests
Victoria, British Columbia

Department of Northern Affairs and National Resources
Calgary, Alberta

State Engineer
Helena, Montana

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
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COOPERATIVE SNOW SURVEYS

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"The Conservation of Water begins with the Snow Survey"